

DESCRIPTIONS OF NEW OR IMPERFECTLY KNOWN SPECIES OF
NAUTILUS FROM THE INFERIOR OOLITE, PRESERVED IN
 THE BRITISH MUSEUM (NATURAL HISTORY).

By G. C. CRICK, F.G.S., etc.,
 Of the British Museum (Natural History).

Read 13th May, 1898.

SEXUAL dimorphism has for a long time been recognized among the shells of the recent *Nautilus*, and it is interesting to find the same character exhibited by species which occur in a fossil state. In the recent *Nautilus* the body-chamber of the shell of the male is more inflated than that of the female, particularly at the sides, and hence the aperture of the former is wider and more obtuse than that of the latter. In the male the aperture of the shell is broad and more or less elliptical; in the female it is more or less oval, being somewhat compressed laterally, especially near the periphery. Similar differences in the form of the body-chamber and of the aperture are exhibited by the examples of some of the species described in the present paper; they are therefore attributed to sexual dimorphism, the forms having the relatively broader aperture being regarded as the males, and those with a narrower and more elongated aperture the females.

Moreover, in some specimens it has been possible to trace very clearly the position of the anterior boundary of the muscular attachment. In the shell of a recent *Nautilus* this boundary exists as a slightly raised line on the inside of the body-chamber, and hence on the internal cast of the body-chamber, such as would be preserved in a fossilized state, this boundary appears as a finely incised line.

1. *NAUTILUS BRADFORDENSIS*, n.sp. Figs. I & II.

Types.—British Museum Coll., Nos. C. 3177 and C. 4503.

Specific Characters.—Shell rather small, compressed, rapidly increasing; greatest thickness in the adult at about the middle of the lateral area, about three-fifths of the diameter of the shell; in the young nearer the umbilicus; height of outer whorl about three-fifths of the diameter of the shell. Whorls two and three-quarters; inclusion complete; umbilicus closed by a shelly callus, slightly depressed. Whorl oval in section, nearly as wide as high; indented to about three-tenths of its height by the preceding whorl; periphery rather broad, somewhat convex (in the less inflated form), sometimes slightly concave (in the more inflated form); sides of the body-chamber inflated, but more flattened in the septate part of the shell, gradually passing into the umbilical

depression without forming any inner area (or umbilical zone). Body-chamber occupying half a whorl; aperture oblique, oval, expanded near the periphery, somewhat contracted at the umbilicus, peristome slightly thickened and everted, especially near the umbilicus, hyponomic sinus wide and deep. Chambers rather deep, about sixteen or seventeen in a whorl; septa moderately convex, suture-line with a broad, shallow, lateral sinus, and nearly straight on the periphery.

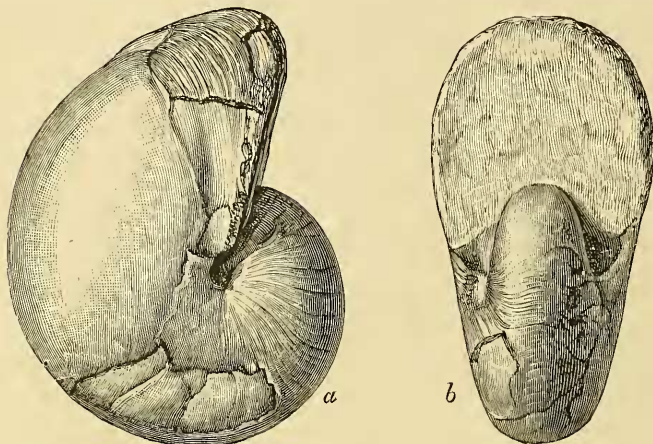


FIG. 1.—*Nautilus Bradfordensis*, n.sp. *a*, lateral view of an example of the less inflated form; *b*, front view of the same. Inferior Oolite (*concarus*-zone): Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 4503]. About five-sixths natural size.

Siphuncle extra-medial. Test almost smooth, ornamented only with growth-lines, which form on the periphery a deep wide sinus corresponding to the hyponomic sinus of the aperture.

Dimensions.

	(i)	(ii)	(iii)
Diameter	70 mm.	64 mm.	42 mm.
Height of outer whorl	43 „	39 „	26 „
Height of outer whorl above } preceding whorl	31 „	26.5 „	
Thickness	43 „	41 „	27 mm.

Remarks.—This species is represented in the British Museum by the three examples the dimensions of which are given above, viz., Nos. C. 4503 (i), C. 3177 (ii), and C. 4256 (iii). In one of these specimens (No. C. 3177) the anterior border of the annulus and of one of the shell-muscles is shown on the internal cast of the body-chamber as a sharply incised line which crosses the periphery in a shallow sinus 13 mm. in advance of the last septum, and on reaching the lateral area turns forward and crosses that area in a bold strongly convex curve.

The same specimen exhibits also the 'black-layer' as a band enveloping the whorl immediately in front of the aperture, its greatest width (7.5 mm.) being at the middle of the periphery.

The largest specimen (No. C. 4503) has the last two septa much nearer together than the rest, and is probably an adult shell.

The peristome is well shown in the specimen No. C. 3177. This example is more robust than the others, but as all the specimens are from the same horizon and locality, this difference is probably merely sexual, the more robust form being the male, the others females. In the shell of the female the aperture is oval and the

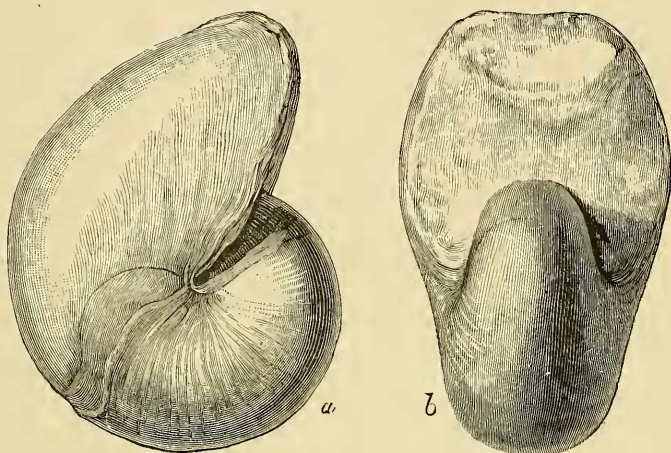


FIG. II.—*Nautilus Bradfordensis*, n sp. *a*, lateral view of an example of the more inflated form, showing the 'black-layer' immediately in front of the aperture, and the fine line indicating the course of the anterior boundary of the muscular scar and of the annulus; a portion of the test on the body-chamber is represented as having been broken away, in order to depict this line, which really exists on the opposite side of the fossil. *b*, front view of the same. Inferior Oolite (*concaus-zone*): Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 3177]. About five-sixths natural size.

periphery convex, while the aperture of the shell of the male is relatively wider, and the periphery somewhat depressed or even slightly concave.

Affinities.—Compared with *N. lineatus*,¹ the present species is a smaller, more rapidly increasing shell, with deeper chambers, and more inflated sides.

¹ J. Sowerby. *Min. Conch.*, vol. i (1813), p. 89, pl. xli. The specimen figured as *Nautilus lineatus* by Mr. Foord and the present writer in *Ann. & Mag. Nat. Hist.*, ser. vi, vol. v (1890), p. 276, fig. 8, and by Mr. Foord in *Cat. Foss. Ceph. British Museum*, pt. ii (1891), p. 212, fig. 41, is really the specimen which we regarded as the type of *N. pseudolineatus*.

Form. and Loc.—Inferior Oolite (*concavus*-zone): Bradford Abbas, Dorset.

Mr. S. S. Buckman has examined these specimens and considers No. C. 4256 to be from “(probably lower part of) *concavum*-zone”; No. C. 3177, from the “fossil bed (probably *concavus*-bed)”; and No. C. 4503, from the “*concavum*-zone (probably *Hyperlioceras*-bed).”

2. NAUTILUS OBSTRUCTUS, E. Eudes-Deslongchamps. Fig. III.

Nautilus obstructus, E. Eudes-Deslongchamps: Jura Normand, Monog. vi (1878), pl. xi, figs. 1 *a-d*, 2 *a-c*.

Specific Characters.—Shell inflated, somewhat rapidly increasing, with broad periphery; greatest thickness (at the aperture) at about the commencement of the outer third of the lateral area, about three-quarters of the diameter of the shell; height of outer whorl about five-eighths of the diameter of the shell. Whorls (number unknown); inclusion complete; umbilicus closed. Whorl trapezoidal in section,

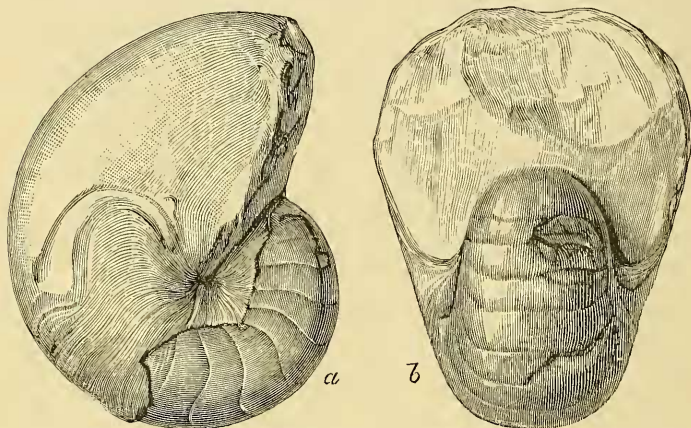


FIG. III.—*Nautilus obstructus*, Eud.-Desl. *a*, lateral view, showing on the natural internal cast of the body-chamber the anterior boundary of the muscular impression; *b*, front view of the same. Inferior Oolite (*Parkinsoni*-zone): Vetney Cross, Dorset. Drawn from a specimen in the British Museum Collection [C. 3187]. Two-thirds natural size.

its height five-sixths of its width, the widest part being near the umbilicus in the septate part of the shell, but near the periphery at the aperture; indented to about two-fifths of its height by the preceding whorl; periphery broad, flattened, slightly convex in the septate part, slightly concave on the body-chamber; sides feebly convex, except near the aperture, where they are more inflated; no inner margin. Body-chamber occupying rather more than one-third of the last whorl; aperture forwardly inclined, lateral portion of peristome convex orad, its peripheral portion with a deep wide

hyponomic sinus. Chambers rather shallow, eleven or twelve in the last half whorl of the septate portion; septa feebly concave; suture-line with a simple shallow curve on the side, and a broad, very shallow sinus on the periphery. Position of the siphuncle unknown. Test almost smooth, with very faint growth-lines, which are slightly waved and nearly direct on the sides, but form on the periphery a deep broad sinus corresponding to the hyponomic sinus of the aperture.

Dimensions.

Diameter	...	...	...	81	mm.
Height of outer whorl	...	...	...	53	„
Height of outer whorl above preceding whorl	}		...	31	„
Thickness			...	62.5	„ (near the periphery).
Width of periphery	...	about	43	„	

At a diameter of 70 mm., i.e. at about one-third of the depth of the body-chamber, the dimensions of the same specimen are:

Diameter	...	...	...	70	mm.
Height of outer whorl	...	...	...	40	„
Thickness	...	...	...	48	„ (near the umbilicus).
Width of periphery	...	...	34	„	

Remarks.—At the aperture the shell is thickest near the periphery, but elsewhere its greatest thickness is close to the umbilicus.

This species is represented in the British Museum Collection by the example (No. C. 3187), the dimensions of which are given above; this is probably an adult shell, the last two septa being much closer together than the rest. On the internal cast of the body-chamber the impression of the anterior border of the shell-muscle and of the annulus is preserved as an incised line, which forms a bold broad orad-convex curve on the greater part of the lateral area, being in the centre of this area about 27.5 mm. in advance of the last suture line, and a very shallow orad-concave curve on the periphery, where it is only about 3 mm. from the last suture-line. The peripheral portion of the peristome with its deep hyponomic sinus is well preserved.

This is evidently the species figured by E. Eudes-Deslongchamps as *Nautilus obstructus* (Jura Normand, Monog. vi, pl. xi, figs. 1*a-d*, 2*a-c*, 1878). Unfortunately, owing to the death of the author, no description was published, but the figures are so good that the species can be readily identified.

It may be mentioned that in the explanation of the plate, Deslongchamps describes the specimen represented in figs. 2*a-c* as a “variété légèrement comprimée, peut-être femelle,” from which it would appear that he regarded the more inflated shell as the male, and the more compressed as the female. This agrees with the most recent observations on the subject.

The British example agrees with the specimen which it would seem that Deslongchamps regarded as the male (figs. 1*a-d*).

Affinities and Differences.—This species differs by its less inflated lateral area and its closed umbilicus from *N. lineolatus*, Foord & Crick.

It is not so robust as the specimen of *N. clausus*, from the D'Orbigny Collection in the Museum of Natural History, Paris, which is figured in Ann. & Mag. Nat. Hist., ser. vi, vol. v, p. 284, fig. 14, and Cat. Foss. Ceph. British Museum, pt. ii, p. 225, and its umbilicus is not closed by a shelly callus as in that example, but it has a broader and more flattened periphery than D'Orbigny's figure of the species in his Pal. Franç. Terr. Jur., vol. i, pl. xxxiii.

Form. and Loc.—Inferior Oolite (*Parkinsoni*-zone): Vetney Cross, Dorset.

Deslongchamps' specimen came from the "zone à *Ammonites Murchisonæ* (couches de récif) de May."

3. NAUTILUS FUSCUS, n.sp. Figs. IV & V.

Types.—British Museum Coll., Nos. C. 4493 and C. 4494.

Specific Characters.—Shell rather small and robust, not very rapidly increasing, somewhat hexagonal in transverse section: greatest thickness—in the more inflated form, at about two-sevenths of the width of the lateral area from the edge of the umbilicus, about seven-tenths

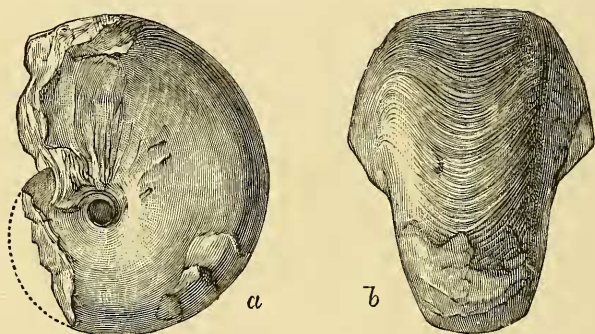


FIG. IV.—*Nautilus fuscus*, n.sp. *a*, lateral view of an example of the more inflated forms; *b*, peripheral view of the same, showing the distinct growth-lines on the periphery. Inferior Oolite: Burton Bradstock, Dorset. Drawn from an example in the British Museum Collection [C. 4493]. Natural size.

of the diameter of the shell; in the less inflated form, somewhat nearer the edge of the umbilicus, and about three-fifths of the diameter of the shell. Whorls few, exact number not known; inclusion nearly complete; umbilicus from about one eighth (in the more inflated form) to about one-seventh (in the less inflated form) of the diameter in width, with subangular margin, deep, exposing the edges of the inner whorls. Whorl trapezoidal in section, wider than high; indented to about one-third of its height by the preceding whorl; periphery broad, slightly convex in centre, feebly concave near each margin, about one-half of the diameter of the shell in width, with prominent subangular margins; sides feebly concave near the periphery, the rest rather convex; inner area (or umbilical zone) steep, almost perpendicular to the plane of symmetry of the shell. Body-chamber occupying

nearly one-half of the outer whorl; aperture not seen, but hyponomic sinus (judging from the direction of the lines of growth) wide and broad. Chambers not very deep, about nine in the last half whorl of the septate part; suture-line with a simple broad shallow sinus on the lateral area, and a broad shallow sinus on the periphery. Siphuncle (in the more inflated form) extra-medial, not seen in the less inflated form. Test varying in thickness, about 1 mm. thick at the edge of the umbilicus, but for the most part much thinner, surface almost smooth, with fine lines of growth which are very faint and almost direct on the lateral area, but are more distinct and form a deep broad sinus on the periphery. In the young shell, up to a diameter of about 16 mm., the test is somewhat coarsely cancellated on the periphery, and the lines of growth relatively coarser and more waved on the lateral area than in the adult shell; the margins of the periphery are also much less prominent. In the adult there are only very faint longitudinal lines on the periphery.

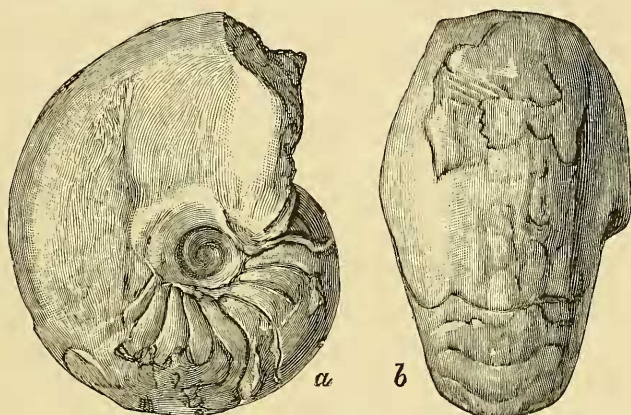


FIG. V.—*Nautilus fuscus*, n.sp. *a*, lateral view of a example of the less inflated form, showing the suture-lines; *b*, peripheral view of the same, showing fragments of the test with its ornaments. Inferior Oolite: Burton Bradstock, Dorset. Drawn from a specimen in the British Museum Collection [C. 4494]. Natural size.

<i>Dimensions.</i>				(i)	(ii)	(iii)
Diameter	...	...	...	41 mm.	24.5 mm.	53.5 mm.
Height of outer whorl	...	...	...	23 "	13 "	29 "
Height of outer whorl above preceding whorl				16.5 "	9 "	19 "
Thickness	...	...	...	29.5 "	16.5 "	about 33 "
Width of umbilicus	...	...	...	5 "	4 "	7 "
Width of periphery at greatest diameter				21 "	12 "	about 25 "

Remarks.—Three specimens in the British Museum Collection are referred to this species: one, No. C. 4494 (iii), is the less inflated form,

another, No. C. 4493 (i), the more inflated form, and a third, No. C. 4492 (ii), is probably a young shell of the latter. The amount of inflation is probably due merely to a difference in sex, in which case the more inflated form is the male, and the other the female. It may also be noted that the peripheral sinus of the suture-line is deeper in the less inflated than in the other form. The largest specimen (53.5 mm. in diameter) has the last two septa very approximate, and is probably an adult shell. All the specimens are from the same locality and horizon.

The British Museum Collection contains a specimen (No. 37,023) from the "Great Oolite, Ranville, Normandy," that may possibly belong to this species. It is larger than the British specimens, its dimensions being:—Diameter, 57 mm.; height of outer whorl, 34 mm.; ditto above preceding whorl, 28 mm.; thickness, 37 mm.; width of umbilicus, 5 mm.; width of periphery at greatest diameter, 31 mm. It is more inflated, and has a smaller umbilicus than the British compressed form, but its periphery is relatively narrower than that of the inflated form.

Form. and Loc.—Inferior Oolite: Burton Bradstock, Dorset. Mr. Buckman considers the three specimens referred to this species to have come from the "upper *Truellei*-beds of Burton Bradstock."

4. NAUTILUS SUBSINUATUS, D'Orbigny. Figs. VI & VII.

Nautilus sinuatus, J. Sowerby: Min. Conch., vol. ii (1818), p. 231, pl. exciv.

Nautilus sinuatus, J. Sby.: A. d'Orbigny, Pal. Franç. Terr. Jur., vol. i (1842), p. 157, pl. xxxii.

Nautilus subsinuatus, A. d'Orbigny: Prod. de Paléont. stratigr., vol. i (1850), p. 260.

Nautilus sinuatus, J. Sby.: E. Eudes-Deslongchamps, Jura Normand, Monog. vi (1877), pl. viii, figs. 1-3.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness close to the umbilical margin, a little less than one-half of the diameter of the shell; height of outer whorl rather more than four-sevenths of the diameter of the shell. Whorls three or four; inclusion nearly complete, about three-fourths in the outer whorl; umbilicus small, about one-eleventh of the diameter of the shell in width, with subangular margin and steep, slightly overhanging sides. Whorl subsagittate in section, rather higher than wide; indented to about three-elevenths of its height by the preceding whorl; periphery obtusely rounded; sides flattened, very feebly convex; inner margin distinct, convex, slightly overhanging the umbilicus. Length of body-chamber not seen. Chambers not very deep, their depth at the periphery being rather less than one-half of the corresponding height of the whorl; suture-line with a deep sinus on the lateral area, about one-third of the corresponding height of the whorl in depth, almost straight on the periphery. Test smooth on the lateral area, ornamented on the peripheral area with moderately fine longitudinal raised lines, which in the young shell extend a little over the lateral area; sides of the umbilicus also with concentric coarser longitudinal raised striæ.

Dimensions.

Diameter	148	mm.
Height of outer whorl	88	"
Height of outer whorl above preceding whorl ...	64	"
Thickness	73	"
Width of umbilicus	13.5	"

Remarks.—There seems to be in the Inferior Oolite more than one concentrically striated *Nautilus* with strongly sinuate septa, and it is by no means easy to determine which of these is Sowerby's species, for that author gives only a short description and a single figure

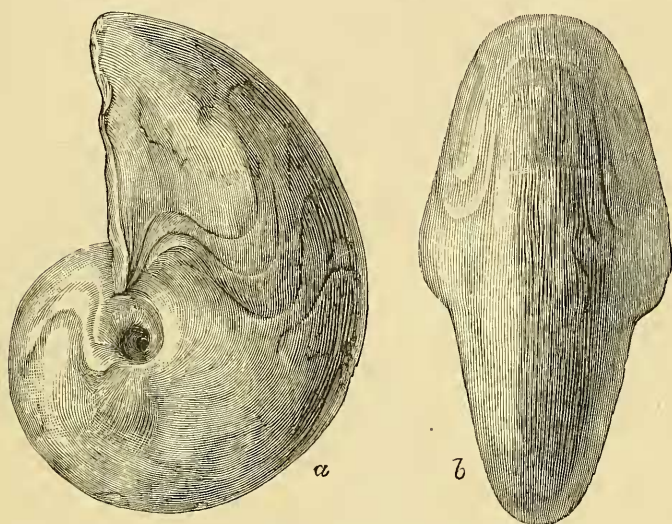


FIG. VI.—*Nautilus subsinuatus*, n.sp. *a*, lateral view, showing the ornaments on the periphery and the course of the suture-line; *b*, peripheral view of the same. Inferior Oolite: near Sherborne, Dorset. Drawn from a specimen in the British Museum Collection [C. 4495]. Rather less than one-half natural size.

of the type. Unfortunately the location of the type-specimen is not known to the writer. Sowerby's description is as follows:— "*Sp. Char.*—Thick, umbilicate, concentrically striated; side depressed, conical; front convex; aperture obtusely sagittate, truncated; the septa have a large sinus on each side." He also remarks that "the striae are nearly close together, moderately fine, and elevated; they gradually disappear towards the mouth"; and that "the greatest diameter is equal to twice the thickness." Two forms of *Nautilus* from the Inferior Oolite, resembling Sowerby's *N. sinuatus*, have come under the writer's observation; in one the thickness is a little less, and in the other a little more, than one-half of the diameter. The more compressed form is, however, also the more finely striated, and

has a suture-line almost identical with that of Sowerby's figure; hence it is here regarded as Sowerby's species.

Judging from D'Orbigny's figure (Pal. Franç. Terr. Jur., vol. i, pl. xxxii) the French specimen appears to be specifically distinct, but Deslongchamps' figure (Le Jura Normand. Monog. vi, pl. viii, figs. 1 *a-c*) of this same example shows that it belongs to Sowerby's species.

The adult form of this species is represented in the British Museum Collection by the specimen No. C. 4495, the dimensions of which are

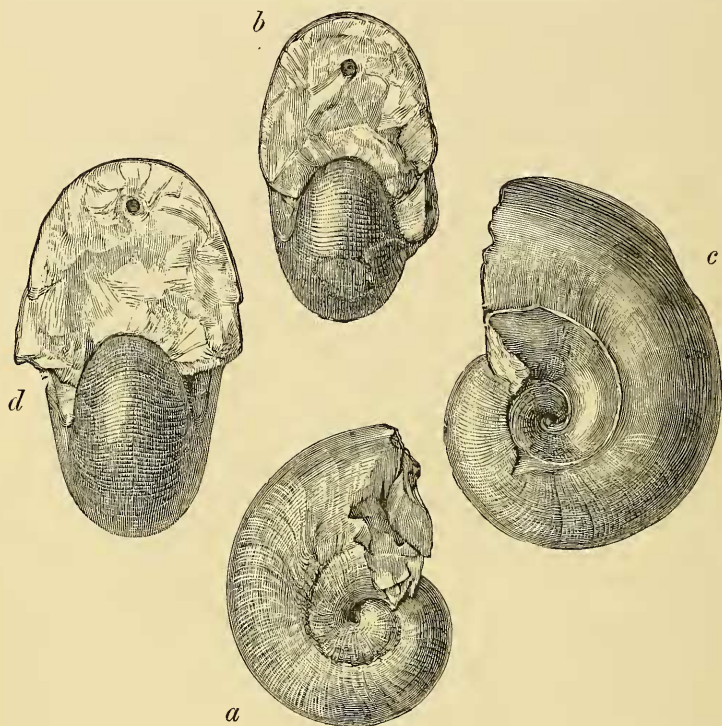


FIG. VII.—*Nautilus subsinuatus*, D'Orb. *a*, lateral view of innermost whorls, showing ornaments of young shell; *b*, front view of the same, showing ornaments, and the position of the siphuncle. Inferior Oolite: Dundry. *c*, lateral view of a somewhat larger example, showing the reticulated ornaments of the test up to a diameter of about 32 mm., passing into the longitudinal striae which are confined to the peripheral area; *d*, front view of same, showing ornaments of test and position of siphuncle. Inferior Oolite: Halfway House, near Sherborne. Drawn from specimens in the British Museum Collection [67,909 and C. 4229]. Natural size.

given above; the younger stages being exhibited by the specimens Nos. 67,909 and C. 4229 in the same collection. The former has the following dimensions:—Diameter, 40 mm.; height of outer whorl,

23 mm.; ditto above preceding whorl, about 19 mm.; thickness, 23 mm.; width of umbilicus, 5 mm.; distance of centre of siphuncle from periphery, 6 mm. The dimensions of the latter are:—Diameter, 50 mm.; height of outer whorl, 28 mm.; ditto above preceding whorl, about 23 mm.; thickness, 28 mm.; width of umbilicus, 7 mm.; distance of centre of siphuncle from periphery, 7 mm. The example No. 67,909 agrees with the younger portion of the specimen No. C. 4229, and this in its turn agrees with the inner portion of the example No. C. 4495. The surface of the shell is reticulated up to the point at which it attains a diameter of about 32 mm.; after that it is ornamented only with longitudinal striæ, which are confined to the peripheral area. The young shells are more compressed than those of *N. ornatus*¹ and *N. Burtonensis*,² and they also lack the slightly sulcated periphery of the latter.

Sowerby's name *N. sinuatus* being preoccupied by Fichtel, D'Orbigny altered it to *N. subsinuatus*.

Affinities and Differences.—This species is closely allied to *N. crassisinuatus*, which is next to be described, and its different points will be alluded to under that species.

Form. and Loc.—Inferior Oolite: Dundry. [No. 67,909.] Inferior Oolite ("probably *Truellei*³ - bed."—S. S. Buckman): Halfway House, near Sherborne, Dorset. [No. C. 4229.] Inferior Oolite ("*Witchellia*-beds—bottom part of 'fossil-bed' of Sandford Lane, or just below that—matrix."—S. S. Buckman): near Sherborne, Dorset. [No. C. 4495.]

Sowerby states that the type, for which he was indebted to Mr. Parkinson, "was found somewhere near Yeovil, but Mr. Parkinson is not acquainted with the exact locality."

5. NAUTILUS CRASSISINUATUS, n.sp. Fig. VIII.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness close to the umbilicus, rather more than one-half of the diameter of the shell; height of outer whorl about three-fifths of the diameter of the shell. Whorls three or four; inclusion nearly complete, about three-fourths in the outer whorl; umbilicus small, about one-tenth or one-eleventh of the diameter of the shell in width, with subangular margin and somewhat convex slightly overhanging sides. Whorl trapezoidal in section, rather higher than wide, indented to about one-fourth of its height by the preceding whorl; periphery broadly rounded; sides flattened, feebly convex; inner area very distinct, somewhat convex, feebly overhanging. Length of body-chamber not seen. Chambers not very deep, their depth measured at the periphery not quite one-half of the corresponding height of the whorl; suture-line with a deep sinus on the lateral area having

¹ Foord & Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v (1890), p. 273, fig. 7.

² Foord & Crick, tom. cit., p. 288, fig. 17.

³ Mr. Buckman says the *Truellei*-beds of Halfway House are called the 'fossil-bed.'

a depth of rather less than one-third of the corresponding height of the whorl, almost straight on the periphery, with an annular lobe. Siphuncle small, near the periphery. Test smooth on the lateral area, but ornamented on the peripheral area with subangular longitudinal waved raised lines, which in the young shell extend on to the lateral area; sides of the umbilicus with coarser longitudinal ornaments crossed by distinct growth lines.

Dimensions.

	(i)	(ii)	(iii)
Diameter	159 mm.	136 mm.	about 145 mm.
Height of outer whorl ...	94 "	82 "	89 "
Height of outer whorl above preceding whorl }	about 69 "	about 60 "	about 67 "
Thickness ... ..	... about 78 "	72 "	78 "
Width of umbilicus ...	14 "	13 "	14 "

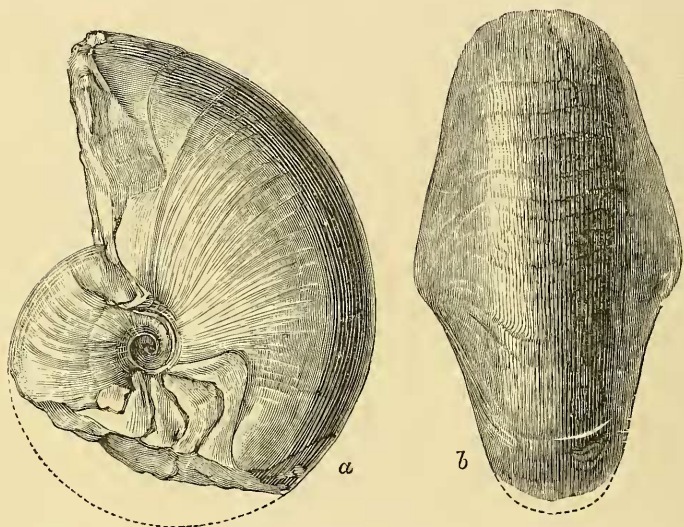


FIG. VIII.—*Nautilus crassisinuatus*, n.sp. *a*, lateral view of an imperfect but well-preserved example, showing the suture-line and the ornaments of the test; *b*, peripheral view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 4501]. Rather less than one-half natural size.

Remarks.—This species is represented in the British Museum Collection by three specimens—No. C. 4112 (i), No. C. 4500 (ii), and No. C. 4501 (iii)—the dimensions of which are given above. They are all from the Inferior Oolite of Bradford Abbas, Dorset. Mr. S. S. Buckman has examined two of them, viz. C. 4500 and C. 4501, and considers them both to be from the “*concarus*-zone (probably *Hyperlioceras*-beds): Bradford Abbas,” a somewhat lower

horizon than that which has yielded the example (No. C. 4495) here referred to *N. subsinuatus*, D'Orb.

Affinities and Differences.—This species comes very near *N. subsinuatus*, D'Orb. (*N. sinuatus*, J. Sowerby), but it is more robust and has a slightly different suture-line. In what is here regarded as Sowerby's species the inner side of the lateral sinus of the suture-line is straighter, and the outer side more curved, than in the present one, so that in this the lowest part of the sinus is further from the umbilicus than in Sowerby's species; the saddle near the umbilical margin is also wider in the last named. If subsequent observations should prove that the two forms occur in the same beds, the differences are so slight that they may then perhaps more correctly be regarded as merely sexual.

Form. and Loc.—Inferior Oolite ("concavus-zone: probably *Hyperlioceras*-bed.")—S. S. Buckman): Bradford Abbas, Dorset.

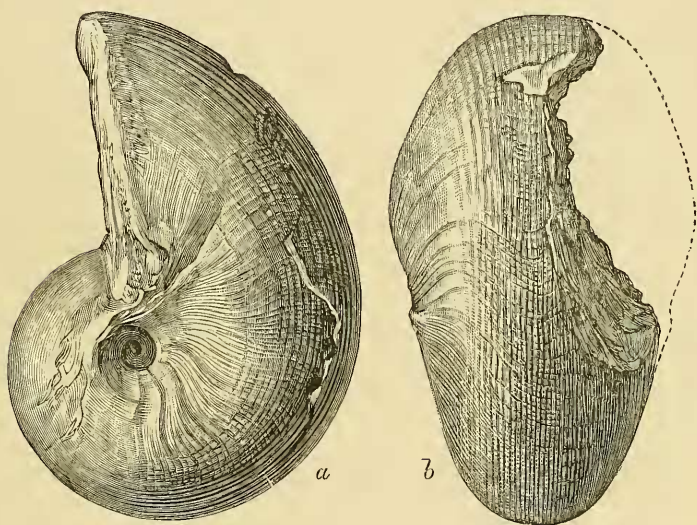


FIG. IX. — *Nautilus impendens*, n.sp. *a*, lateral view of the type-specimen; *b*, peripheral view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from the specimen in the British Museum Collection [C. 4502]. About one-half natural size.

6. NAUTILUS IMPENDENS, n.sp. Fig. IX.

Type.—British Museum Coll., No. C. 4502.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness near the umbilical margin, rather more than one-half of the diameter of the shell; outer whorl about seven-twelfths of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus narrow, about one-twelfth of the diameter of the shell in

width, with convex margin, and convex and overhanging sides. Whorl oval in section, the peripheral portion being the narrower; periphery broadly rounded, passing imperceptibly into the sides; sides convex, very slightly flattened; inner margin convex, not sharply marked off from the side, and overhanging the umbilicus. Length of body-chamber not seen. Chambers rather shallow, their depth at the periphery about two-fifths of the corresponding height of the whorl; septa slightly concave, suture-line with a broad and not very deep sinus on the lateral area. Siphuncle near the periphery. Test—on the lateral area nearly smooth, only with backwardly directed lines of growth; on the periphery with rather coarse longitudinal waved lines, which with age encroach somewhat on the lateral area, with much finer lines in the interspaces, the transverse lines of growth forming here a deep broad hypomic sinus.

Dimensions.

Diameter	...	...	...	...	...	125	mm.
Height of outer whorl	...	...	...	...	...	77	,,
Height of outer whorl above preceding whorl	...	...	...	...	...	57	,,
Thickness	...	...	...	...	...	65	,,
Width of umbilicus	...	...	...	...	...	10.5	,,

Remarks.—There is only one example of this species. It came from Bradford Abbas, and Mr. S. S. Buckman, from an examination of the matrix, considers it to have come from the “*concavus*-zone (probably *Hyperlioceras*-bed),” a somewhat lower horizon than that containing the *N. subsinuatus*, but the same as that yielding *N. crassisinuatus*.

The name of the species is derived from the overhanging character of the inner portion of the whorl.

Affinities and Differences.—Its less sinuous suture-line at once separates this species from both *N. subsinuatus*, D’Orb. (*N. sinuatus*, J. Sowerby), and *N. crassisinuatus*; whilst the form of its umbilicus and the smoothness of the lateral area of the test distinguish it from *N. ornatus*.

Form. and Loc.—Inferior Oolite (“*concavus*-zone: probably *Hyperlioceras*-bed.”—S. S. Buckman): Bradford Abbas, Dorset.

7. NAUTILUS EXTEREBRATUS, n.sp. Fig. X.

Types.—British Museum Coll., Nos. C. 3245 and C. 4498.

Specific Characters.—Shell inflated, rather rapidly increasing; greatest thickness sometimes (i.e. in the less inflated form) close to the edge of the umbilicus, sometimes (i.e. in the more inflated form) at a short distance from the edge of the umbilicus, about three-fourths of the diameter of the shell; height of outer whorl rather more than one-half of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus deep, about one-eighth or one-ninth of the diameter of the shell in width, with steep sides and subangular margin. Whorl subquadrate in section, its height about two-thirds of the width; indented to about three-eighths of its height by the preceding whorl; periphery broad, sometimes (i.e. in the less

inflated form) slightly convex, sometimes (i.e. in the more inflated form) flattened or even slightly concave, particularly on the body-chamber, passing imperceptibly into the sides; sides feebly convex; inner area almost perpendicular to the plane of symmetry of the shell, well-defined from the lateral area by a subangular ridge. Body-chamber occupying about one-third of the outer whorl; aperture with a wide and deep hyponomic sinus. Chambers not very deep, about ten in the last half whorl of the septate part, at the centre of the periphery not quite one-half of the corresponding height of the whorl

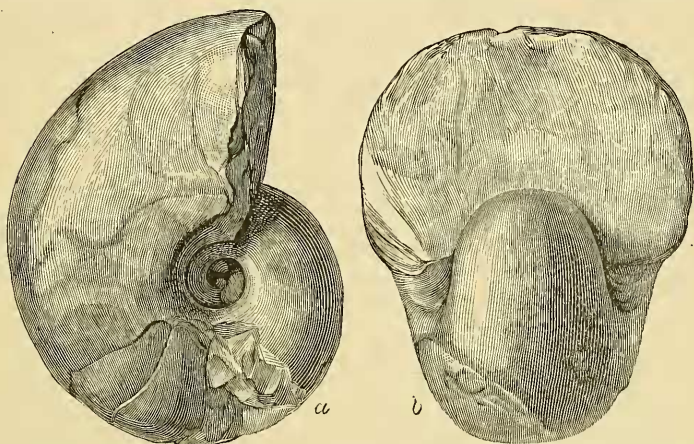


FIG. X.—*Nautilus exterebratus*, n sp. *a*, lateral view of an example of the more inflated form; *b*, front view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 3245]. About two-thirds natural size.

in depth; septa feebly concave; suture-line with a simple shallow curve on the lateral area, almost straight on the periphery. Siphuncle not seen. Test rather thick, much thicker at the umbilical margin, with apparently smooth surface, or with only very faint lines of growth.

Dimensions.

	(i)	(ii)
Diameter	96 mm.	123 mm.
Height of outer whorl ...	53 "	68 "
Height of outer whorl above } preceding whorl }	36 "	43 "
Thickness	73 "	95 "
Width of umbilicus	12.5 "	13 "
Greatest width of periphery ...about	58 "	{ imperfectly defined.

Remarks.—There are two examples of this species in the British Museum Collection (Nos. C. 3245 and C. 4498); their dimensions are

given above. No. C. 3245 (i) is the more inflated, and C. 4498 (ii) the less inflated form. They are both from Bradford Abbas.

Affinities and Differences.—This species may be distinguished from *N. terebratus*¹ by its smooth shell, more inflated whorls, wider and flatter periphery, and the less prominent umbilical margin; and from *N. semiornatus*² by the more quadrate form of the transverse section of its whorls, its smaller umbilicus, and the absence of longitudinal ornaments.

Form. and Loc.—Inferior Oolite: Bradford Abbas, Dorset. Mr. Buckman has examined both specimens: he considers No. C. 3245 to have come from the “fossil bed (probably *concarus*-bed), Bradford Abbas”; and No. C. 4498 to have been derived from the “*concarus*-zone (probably *Hyperlioceras*-bed), Bradford Abbas.” Judging from their matrix they appear to have been obtained from the same bed.

8. NAUTILUS ROTUNDUS, n sp. Fig. XI.

Type.—British Museum Coll., No. C. 3181.

Specific Characters.—Shell more or less subglobose, with small umbilicus; greatest thickness near the middle of the lateral area, about three-fourths of the diameter of the shell; height of outer

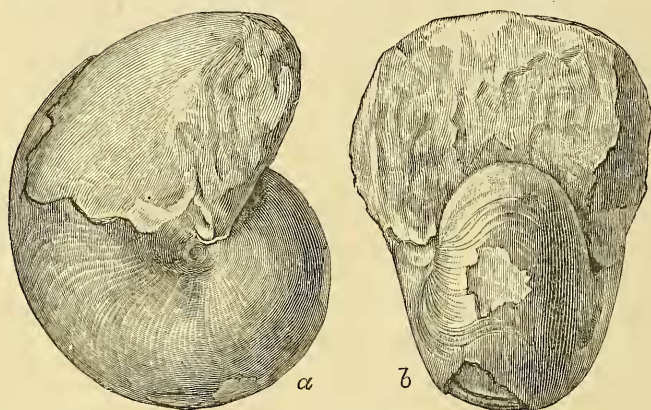


FIG. XI.—*Nautilus rotundus*, n.sp. *a*, lateral view of the type-specimen; *b*, front view of the same. Inferior Oolite: Sherborne, Dorset. Drawn from an example in the British Museum Collection [C. 3181]. Rather more than one-half natural size.

whorl about five-ninths of the diameter of the shell. Whorls three; inclusion nearly complete; umbilicus small, deep, with rounded margin. Whorl subtrapezoidal in transverse section, its height about three-fourths of its width; indented to about two-fifths of its height

¹ E. Dumortier, *Études Paléontologiques sur les Dépôts Jurassiques du Bassin du Rhône*, pt. iv (Lias Supérieur), 1874, p. 42, pl. vi, figs. 1-4.

² Vide *infra*, p. 135.

by the preceding whorl; periphery broadly convex, somewhat flattened, especially at the body-chamber; sides inflated and passing imperceptibly into the inner area; inner area convex, imperfectly defined. Body-chamber occupying about one-third of the last whorl; aperture with a deep and broad hyponomic sinus. Chambers rather deep, about eight in the last half whorl of the septate portion; septa feebly concave; suture-line with a simple shallow sinus on the lateral area, and only a very shallow sinus on the periphery. Siphuncle infra-central. Test 1 mm. thick, almost smooth, with faint lines of growth, which curve backward on the outer portion of the lateral area and form a deep wide sinus on the periphery.

Dimensions.

	(i)	(ii)
Diameter of shell	98 mm.	110 mm.
Height of outer whorl	59 "	62 "
Height of outer whorl above preceding whorl	35 "	41 "
Thickness	about 72† "	84† "
Width of umbilicus	4 "	4 "

(† Not including the test.)

Remarks.—To this species we refer two specimens in the British Museum Collection—Nos. C. 3181 (i) and C. 4496 (ii); their dimensions are given above. In the example No. C. 4496 the last loculus is much smaller than the rest, being only 7 mm. in depth at the centre of the periphery, the adjacent one being 16 mm. deep. Probably, therefore, this is an adult specimen. In both examples the greatest width of the aperture is near the middle of the lateral area; the height of the aperture in proportion to its width is, however, greater in (ii) than in (i), and the periphery of the former is less depressed than that of the latter, but these differences are so very slight that they may be only individual variations.

There is also in the British Museum Collection another specimen (No. C. 4489) which for the present at least we would refer to this species. Its dimensions are as follows:—Diameter of shell, 93 mm.; height of outer whorl, 53.5 mm.; ditto above preceding whorl, 35 mm.; greatest thickness, 70 mm. (not including the test); width of umbilicus, 5 mm. It differs from the others in having a more quadrate and more expanded aperture, and a somewhat larger umbilicus. In this specimen the position of the anterior border of the shell-muscle and of the annulus is clearly indicated on the natural internal cast of the body-chamber by an incised line, which forms a bold anteriorly convex curve on the lateral area; in the centre of the periphery this line is only 5 mm. in advance of the edge of the last septum, but on the lateral area the most convex portion is as much as 32 mm. in advance of the corresponding part of the same septum.

Affinities and Differences.—Compared with *Nautilus subrotundus*,¹

¹ Vide infra, p. 134.

the present species has more inflated whorls and a more convex umbilical margin, while the convex and imperfectly-defined umbilical margin at once distinguishes it from *Nautilus Smithi*.¹

Form. and Loc.—The specimen No. C. 3181 is labelled "*Sauzei*-zone, Sherborne," but Mr. Buckman, who has examined it, believes it to be "either from the *Sauzei*- or from the *Witchellia*-zone, Sherborne, the matrix being whitish with green grains." The other examples (Nos. C. 4489 and C. 4496) are, in Mr. Buckman's opinion, from "the bottom bed of the 'fossil-bed' of Sandford Lane with Ammonites of *fissilobatus* type."

9. *NAUTILUS SUBROTUNDUS*, n.sp. Fig. XII.

Type.—British Museum Coll., No. C. 3183.

Specific Characters.—Shell subglobose, somewhat compressed; greatest thickness near the edge of the umbilicus, about two-thirds of the diameter of the shell; height of outer whorl about five-ninths of

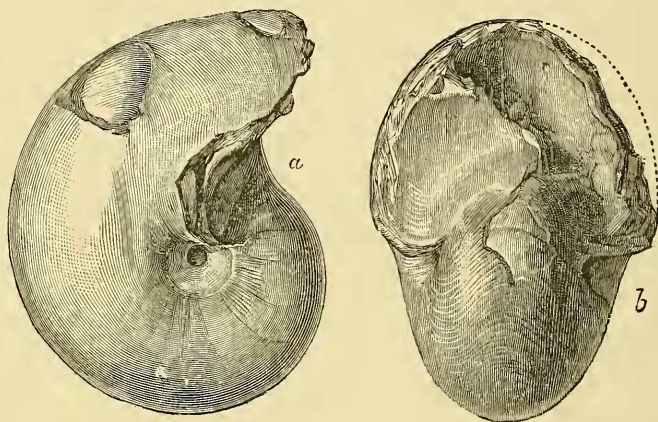


FIG. XII.—*Nautilus subrotundus*, n.sp. *a*, lateral view of the type-specimen; *b*, front view of the same. Inferior Oolite: Sherborne, Dorset. Drawn from the example in the British Museum Collection [C. 3183]. Rather more than one-half natural size.

the diameter of the shell. Whorls few (? number); inclusion nearly complete; umbilicus small, deep, with rounded margin. Whorl semi-elliptical in section, the height five-sixths of the width; indented to nearly two-fifths of its height by the preceding whorl; periphery broadly convex, continuous with the sides; sides feebly convex, passing imperceptibly into the inner area; inner area convex, imperfectly defined. Body-chamber not seen. Chambers rather

¹ A. H. Foord & G. C. Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v, p. 287, fig. 16.

deep; septa feebly concave, their inner (dorsal) portion projected considerably forward over the preceding whorl; suture-line with a shallow lateral sinus, and a very shallow peripheral sinus. Siphuncle extra-median, small. Test nearly smooth, with very fine growth-lines, which have a nearly radial direction on the lateral area, curve backward near the periphery, and on the latter form a fairly deep, obtusely V-shaped sinus.

Dimensions.

Diameter of shell ...	...	...	...	...	99	mm.
Height of outer whorl ...	...	...	...	...	58	„
Height of outer whorl above preceding whorl ...	...	...	...	...	37	„
Thickness ...	...	...	...	...	about 69	„
Width of umbilicus ...	...	...	...	...	5.5	„

Remarks.—This species is represented in the British Museum Collection by only one example (No. C. 3183), the dimensions of which are given above. This specimen lacks the body-chamber; but since the last loculus is shallower than those which precede, it is probably an adult example.

Affinities and Differences.—Compared with *Nautilus rotundus*,¹ the present species has less inflated whorls and a more prominent and subangular umbilical margin; this latter character is, however, much less pronounced than in *Nautilus Smithi*.²

Form. and Loc.—The type-specimen (No. C. 3183) is labelled “*Sauzei*-zone, Sherborne,” but, judging from the matrix, Mr. Buckman considers it to be “probably from the *Truellei*-bed at Burton Bradstock.”

10. NAUTILUS SEMIORNATUS, n.sp. Figs. XIII & XIV.

Types.—British Museum Coll., Nos. C. 3244 and C. 4499.

Specific Characters.—Shell inflated, rather rapidly increasing; greatest thickness almost close to the edge of the umbilicus, from about three-fourths (in the less inflated form) to about four-fifths (in the more inflated form) of the diameter of the shell; height of outer whorl a little more than one-half of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus deep, about one-seventh of the diameter of the shell in width in the more inflated form, a little smaller in the less inflated form, with steep sides and subangular margin. Whorl subquadrate in section, its height about two-thirds of its width; indented to about one-third of its height by the preceding whorl; periphery broad, feebly convex in the less inflated form, in the more inflated form flattened and even slightly concave, especially on the body-chamber, with obtusely angular margins; sides feebly convex; inner margin rather wide, almost perpendicular to the plane of symmetry, its inner half ‘undercut,’ well-defined from the

¹ Vide supra, p. 132.

² A. H. Foord & G. C. Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v, p. 287, fig. 16.

lateral area by a subangular ridge. Length of body-chamber not seen; aperture with a wide and deep hyponomic sinus. Chambers not very deep, measured at the centre of the periphery not quite one-half of the corresponding height of the whorl in depth; septa feebly concave; suture-line with a simple shallow curve on the lateral area and an extremely shallow curve on the periphery. Siphuncle median. Test rather thick, with distinct lines of growth, which are almost straight on the sides and form a deep and wide sinus on the periphery; the inner area of the whorl, the inner portion of the lateral area, and the periphery also with rather coarse spiral striæ, those on the periphery being rather obscure; towards the aperture all these spiral lines become obsolete.

Dimensions.

	(i)	(ii)
Diameter	95 mm.	80 mm.
Height of outer whorl	50 "	44.5 "
Height of outer whorl above } preceding whorl	37.5 "	30 "
Thickness	78 "	61 "
Width of umbilicus	13.5 "	10.5 "

Remarks.—Two forms of the species can be recognized. There is an example of each in the British Museum Collection; their dimensions

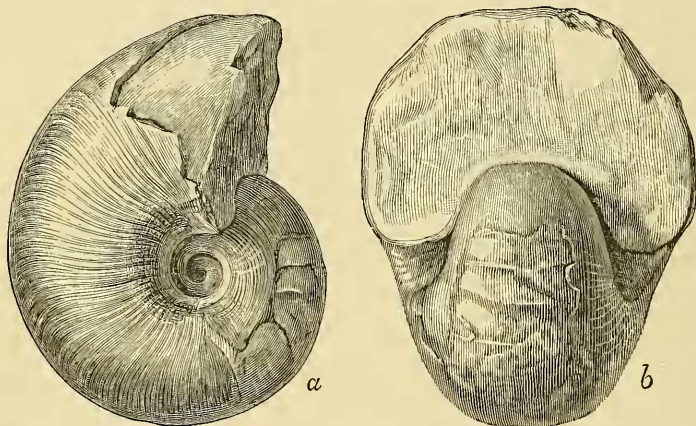


FIG. XIII.—*Nautilus semiornatus*, n.sp. *a*, lateral view of one of the type-specimens, an example of the more inflated form of the species; *b*, front view of the same specimen. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 4499]. About three-fifths natural size.

are given above. The broad form, with a flattened or slightly concave periphery, is represented by the specimen No. C. 4499 (i), and the more compressed form, with a more convex periphery, by the example No. C. 3244 (ii). The latter specimen is entirely septate, and shows

the central position of the siphuncle; it probably was, when complete, quite as large as the broad form.

The larger specimen (C. 4499) exhibits the impression of the deep hyponomic sinus of the aperture.

Affinities and Differences.—This species is closely allied to *N. Smithi*,¹ but careful comparison with the type of that species shows that the present species increases less rapidly, and has a larger umbilicus than that species. In *N. exterebratus*² the whorl is more quadrate in section, the umbilicus smaller, and the test without longitudinal ornaments and nearly smooth.

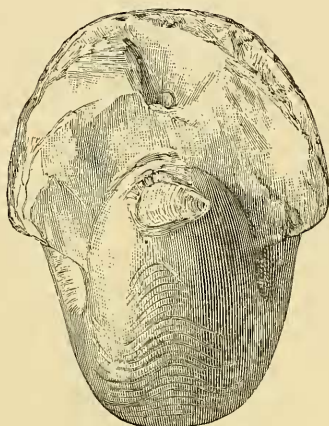


FIG. XIV.—*Nautilus semiornatus*, n.sp. Front view of an example of the less inflated form. Inferior Oolite: Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 3244]. About two-thirds natural size.

Form. and Loc.—Inferior Oolite (*concavus*-zone): Bradford Abbas. Both specimens are labelled "*concavum* - zone, Bradford Abbas." Mr. Buckman, after a careful examination of the matrix of the specimens, considers No. C. 4499 to be from the "*concavum*-zone (probably *Hyperlioceras*-beds), Bradford Abbas," and No. C. 3244 from the "fossil-bed of Bradford Abbas (probably upper part with *Hyperlioceras*)."

11. NAUTILUS EXIGUUS, n.sp. Fig. XV.

Types.—British Museum Coll., Nos. C. 4233 and C. 4235.

Specific Characters.—Shell small, rather rapidly increasing, narrowly umbilicated; greatest thickness at the umbilical margin, about two-thirds of the diameter of the shell; height of outer whorl about four-sevenths of the diameter of the shell. Whorls few, exact number

¹ Foord & Crick: *Ann. & Mag. Nat. Hist.*, ser. VI, vol. V (1890), p. 287, fig. 16.

² Vide supra, p. 130.

not seen; inclusion nearly complete; umbilicus small, deep, with subangular margin. Whorl subquadrate in section, wider than high; indented to about one-fourth of its height by the preceding whorl; periphery broad, flattened, feebly convex, with obtusely angular margins; sides flattened, convergent; inner area fairly well defined, rather wide, steep. Body-chamber occupying rather more than one-third of the outer whorl, aperture not seen, but judging from

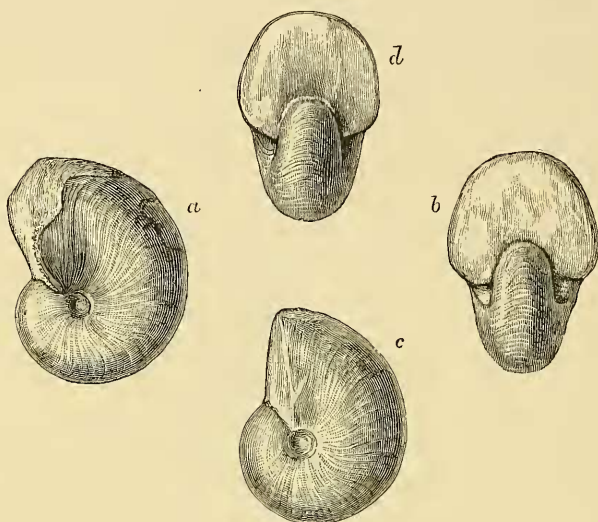


FIG. XV.—*Nautilus exiguus*, n.sp. *a*, lateral view of an example of the less inflated form; *b*, front view of the same; *c*, lateral view of an example of the more inflated form; *d*, front view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from the type-specimens in the British Museum [C. 4233 and C. 4235]. Natural size.

the lines of growth, with a deep hyponomic sinus; depth of chambers not seen; suture-line with a simple shallow curve on the lateral area and a very shallow curve on the periphery. Siphuncle not seen. Test with fine lines of growth, which are slightly sinuated on the sides, and form a deep broad sinus on the periphery; the whole of its surface with obscure waved longitudinal lines.

Dimensions.

	(i)	(ii)
Diameter	28 mm.	27 mm.
Height of outer whorl ...	15·5 "	16 "
Height of outer whorl above preceding whorl } about	12 "	11 "
Thickness	18·5 "	19·5 "
Width of umbilicus	3 "	2 "
Approximate width of periphery	11 "	11 "

Remarks.—This species is represented in the British Museum Collection by the two examples—Nos. C. 4233 (i) and C. 4235 (ii)—whose dimensions are given above. They are clearly not the inner whorls of larger specimens, because in each fully one-third of the outer whorl is occupied by the body-chamber. As will be seen from the measurements given above, the specimen No. C. 4235 is slightly more inflated than the example No. C. 4233; its periphery is also more broadly rounded. These differences may possibly be of a sexual character, but they are so slight that it is not at all improbable that they are merely individual variations.

Affinities and Differences.—This species appears to be allied to *N. lineolatus*, but its peripheral margins are much less angular and its whorls increase in thickness more rapidly.

Form. and Loc.—Inferior Oolite: Bradford Abbas, Dorset. Mr. Buckman has examined these specimens, and is of opinion that they came from the “*concavus*-zone (probably *Hyperlioceras*-bed), Bradford Abbas.”